



[11] **Patent Number:** **5,528,735**

[45] **Date of Patent:** Jun. 18, 1996

- [54] **METHOD AND APPARATUS FOR  
DISPLAYING DATA WITHIN A  
THREE-DIMENSIONAL INFORMATION  
LANDSCAPE**
- [75] Inventors: **Steven L. Strasnick**, Mountain View;  
**Joel D. Tesler**, Cupertino, both of Calif.
- [73] Assignee: **Silicon Graphics Inc.**, Mountain View,  
Calif.
- [21] Appl. No.: **42,801**
- [22] Filed: **Mar. 23, 1993**
- [51] Int. Cl.<sup>6</sup> ..... **G06T 15/20**
- [52] U.S. Cl. .... **395/127; 395/160**
- [58] Field of Search ..... **395/119, 120,  
395/127, 154, 160**

Structural Dynamics Research Corporation News Release, "SDRC Announces Software Translator Between CADAM and I-DEAS", Mar. 31, 1992.

BYTE, "The Ultimate User Interface", by Bob Jacobson, dated Apr. 1992, pp. 175-182.

"An Easier Interface", by Mark A. Clarkson, dated Feb., 1991, BYTE, pp. 277-282.

BYTE Advertisement, "See Your Act Contacts Geographically", dated Mar. 1992, p. 78.

BYTE Advertisement, "Unix Graphics, Mail, and More", dated Mar. 1992, p. 78.

BYTE Advertisement, "Project Management with Motif GUI", dated Mar. 1992, p. 78.

BYTE Advertisement, "Forecast Like a Pro", dated Mar. 1992, p. 78.

"PC GIS: Expect Gain But Also Some Pain", by Alan Radding, dated Feb. 17, 1992, Computer world, p. 89.

(List continued on next page.)

[56] **References Cited**

## U.S. PATENT DOCUMENTS

3,816,726	6/1974	Sutherland et al. ....	395/127 X
4,868,771	9/1989	Quick et al. ....	364/578
4,928,247	5/1990	Doyle et al. ....	364/518
4,994,989	2/1991	Usami et al. ....	364/522
5,043,920	8/1991	Maln et al. ....	364/521
5,072,395	12/1991	Bliss et al. ....	364/443
5,150,457	9/1992	Behm et al. ....	395/119
5,164,904	11/1992	Summer ....	364/436
5,295,243	3/1994	Robertson et al. ....	395/160
5,307,456	4/1994	MacKay ....	395/154

## OTHER PUBLICATIONS

Carlborn et al., "A Hierarchical Data Structure For Representing The Spatial Decomposition Of 3-D Objects", IEEE Computer Graphics & Applications, Apr. 1985, pp. 24-31.  
 Carlborn et al., "Planar Geometric Projections And Viewing Transformations", Computing Surveys, vol. 10, No. 4, Dec. 1978, pp. 465-502.

"Virtual Reality Gets Real", by Tony Reveaux, dated Jan., 1993, *New Media*, pp. 32-34.

IEEE Proceedings, Visualization 91, "Tree-Maps: A Space-Filing Approach to the Visualization of Hierarchical Information Structures", by Brian Johnson and Ben Shneiderman, dated Oct., 1991.

*Primary Examiner*—Mark K. Zimmerman

Attorney, Agent, or Firm—Sterne, Kessler, Goldstein & Fox

[57] **ABSTRACT**

A method and apparatus are presented for displaying three-dimensional navigable display space containing an aggregation of graphical objects and an overview of the aggregation of display objects. An altered perspective is provided by compressing the horizontal dimension of the displayed objects so that a user can see a representative overview of the entire aggregation of display objects that have been selected for display together on a display screen. The compressed component is expanded so that the objects appear wider as a navigator approaches the displayed objects. A spotlight shines down on objects responsive to a data query. The spotlight serves as a navigation aid to the navigator so that highlighted items are visible from a distance and can be easily located. The user's view of the display space is altered so that the navigator perceives that he is traveling in a straight line when approaching a display object in a display space in which the horizontal dimension of displayed objects is compressed in accordance with the apparent distance between a displayed object and the navigator.

**30 Claims, 22 Drawing Sheets**

